**UNIT PLAN, CULMINATING TASK AND TEST**

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**Presented to:**

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**As a part of the requirements for :**

**2011-EAQ1320Y-S**

**Unit plan overview**

SCH3U – Matter and chemical bonding

Expectations covered:

B2. investigate physical and chemical properties of elements and compounds, and use various

methods to visually represent them;

B3. demonstrate an understanding of periodic trends in the periodic table and how elements combine to form chemical bonds.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Lesson | Concept | Activity | Duration | Learning Strategy used | Assessment strategy |
| 1 | B3.1 - Atomic number and mass number | Review the structure of the atom and demonstrate that the mass number is the sum of the nucleons for a particular element. Revisit the concept of isotopes and radioisotopes. Students are given 20 minutes to work on a handout or an online quiz. | 1.5 hour | Collaborative Problem solving: students work on an  Online quiz <http://www.barnsley.org/penistone-grammar/science/HTML%20Files/Simple_atomic_structure.html#Quiz>  with typical problem sets.  Handouts can be distributed for homework. | **For - Diagnostic Assessment** |
|  | | Review the previous days concepts and use oral questioning to validate understanding (and homework if applicable) | 0.5 hour |  |  |
| 2 | B3.2 - Isotopic abundance and atomic mass | Explain that atomic mass is relative based on the abundance of elements found on the earth. Demonstrate a few examples on the board (like carbon 14, carbon 12) to show the atomic mass relationship. | 1 hour | Socratic episode: a brief review of the concepts. | **FOR/OF** - Learning Log –formative assessment on student development on understanding the concept, pictorial –lewis structure, bonding (dots and cross)scientific vocabulary list |
|  | Review previous days concept and homework assignment | 0.5 hour |  | **OF** -Formative Assessment |
| 3 | B3.3. - Periodic law - tendencies | Review electron arrangement and forces. Ask students expected trends before showing results for atomic radius and ionization energy. Review both key concepts using projected media. | 1 hour | -Multimedia presentation (ie. Youtube video)  - Computer quiz: <http://people.sps.lane.edu/jtyser/chem/Quiz/Unit8/ptrend.htm> |  |
|  |  | Review previous days concept and homework assignment | 0.5 hour |  | **FOR**  - Formative Assessment |
|  |  | Discuss concepts of electron affinity and electronegativity. Ask students what they expect in terms of periodic trends for these two parameters. Comparison of metals and non metals on the basis of reactivity series in the periodic table | 1 hour | - Discussion( ELL student can pair up with peer)  - Q + A  - Problem Solving: Handouts containing typical problems can be assigned as homework | Learning Log, Formative Assessment |
|  |  | Review previous days concept and homework assignment | 0.5 hour |  |  |
|  | B2.2 – Analyze data within a period | Assign students in groups of 4 to work on a brief 6 minute presentation on an assigned periodic trend. Students are given data to work with and each of them must present the result for 2 minutes . | 1 hour | - Cooperative learning  IEP, ELL students can practice with Special Ed and ESL teachers. | **OF** - Student presentations  Rubrics will be provided for communication skills, concept knowledge and for  Learning skills example.  Collaboration, responsibility, initiative |
|  | **FORMATIVE TEST** | **COVERS ALL CONCEPTS LEARNED TO DATE** | 1 hour | Paper and Pencil Q + A | **FOR** - Test |
|  | FORMATIVE REVIEW | REVIEW TEST RESULTS AND REVIEW ANSWERS WITH THE CLASS | 0.5 hour | Discussion: discussing the answers and determining possible misconceptions | **AS** -Self assessment or Peer assessment |
| 4 | B3.4 – Ionic and covalent bonds | Review concepts taught in grade 10 such as transfer and sharing of electrons, metals, non-metals etc... Provide examples of ionic bonds and covalent bonds | 1 hour | Direct Instruction Strategy Socratic Episode: brief review of the concepts. |  |
|  | B2.4 – Lewis structures | Assign students ‘lab’ time to work on gizmo simulations on ionic bonds and covalent bonds. At the end students will take an online gizmo quiz | 1 hour | -Computer simulation : (2 Gizmos: Covalent Bonds and Ionic Bonds + assessment Q’s.) | Observation |
|  | B2.7 – IUPAC nomenclature | Review nomenclature for ionic (polyatomic) and molecular compounds | 1 hour | - Independent reading  - Handouts with typical problem sets can be assigned | Observation for formative assessment |
|  |  | Review previous days concept and homework assignment | 0.5 hour |  |  |
| 5 | B3.5 – Physical properties of ionic and molecular compounds | Contrast the physical properties such as melting point, ductility, solubility etc... | 1 hour | Demonstrations: Teacher will perform practical demonstrations while student observe. | Observation |
|  |  | Review previous days concept and homework assignment | 0.5 hour | Pre-Lab: read laboratory + answer sample Q’s to prepare for lab. | **FOR** -Formative assessment |
| 6 | **Laboratory** | Organize students in groups of 2 and assign unknown samples. Students must identify through physical analysis which compounds are ionic or molecular in nature | 1 hour | Independent Learning Strategy -lab activities : Students will perform the lab and complete the report as homework. | **OF -Performance** Task or Exhibition/Demonstration Task |
| 7 | B2.5 – Nature of bonds | Using electronegativity values, predict the nature of bonds (non-polar, covalent, polar covalent, ionic). Demonstrate that the difference in electronegativity helps determine the nature of bonds | 1 hour | Cooperative learning: students research online the effects of electronegativity.  Modeling the different nature of the bonds using molecular models  Online quiz: http://www.softschools.com/testresults.do?id=943 | **FOR** – Formative assessment |
|  |  | Review previous days concept and homework assignment | 0.5 hour |  |  |
|  | **FORMATIVE TEST** | **COVERS ALL CONCEPTS LEARNED AFTER FIRST FORMATIVE TEST** | 1 hour | Paper and Pencil Q + A | **FOR** -Test |
|  | FORMATIVE REVIEW | REVIEW TEST RESULTS AND REVIEW ANSWERS WITH THE CLASS | 0.5 hour | Discussion: discussing the answers and determining possible misconceptions | **AS -Self** Assessment before Summative task |
|  | SOMMATIVE ASSESSEMENT |  | 1 hour |  | **OF - Unit TEST** |

**Reference:**

Ontario Ministry of Education science curriculum – Grade 11 and 12; <http://www.edu.gov.on.ca/eng/curriculum/secondary/2009science11_12.pdf>

SCH3U July 2011

**CULMINATING PROJECT (SOMMATIVE)**

**Matter and chemical bonding**

Name:

**Expectations covered:**

B2. investigate physical and chemical properties of elements and compounds, and use various methods to visually represent them;

B3. demonstrate an understanding of periodic trends in the periodic table and how elements combine to form chemical bonds.

**Project Outline**

1. Conduct scientific research with two partners on one of the chemical topics listed (see attached list).
2. The emphasis of the project is to be on the chemical nature (i.e. bonds, chemical characteristics etc.) of your topic, what you have learned in class and how these relate to our daily lives.
3. Demonstrate your comprehension of the topics by providing in depth explanations on formulae, figures, models and pertinent representations.

**Expected production**

Your group will prepare an audio/visual lesson lasting approximately 10-15 minutes. Your goal is to educate your fellow classmates on one of the topics from the subject list. In order to do this you must :

1. Demonstrate expert knowledge on your topic; remember you are the teacher(s)
2. Make the presentation fun and interesting while keeping an emphasis on learning
3. A discussion on how your chemical subject relates to practical aspects of our lives
4. A conclusion offering your thoughts on the importance of your subject and your findings
5. Most importantly – avoid plagiarism: *cite all sources including pictures, graphics etc.... (see last page for guide)*

***Note:*** *Also remember to check the attached rubric to gain a better understanding on what you will be graded on*

**Suggested format**

Your presentation can be a PowerPoint, posters, multimedia or any combination of these as long as it is audio/visual.

The suggested format should be:

1. Introduction
2. Table of contents
3. Historical content and background information
4. Chemical aspects of the concept (remember to relate what you have learned in class to your subject topic)
5. Discussion of the practical nature of the concept
6. Conclusion
7. References

Lesson topics

(your topic choice must be approved by the teacher: all choices are final)

Topic 1

Discuss the chemical properties of one of the materials below and how that substance affects the environment, and propose ways to lessen the harmfulness of the substance or identify alternative substances that could be used for the same purpose:

1. Household cleaning product
2. Fertilizers
3. Pesticide
4. Herbicide
5. Windshield washer fluid with de-icer
6. Road ‘salt’
7. Other pertinent chemical (see teacher for approval before proceeding)

Topic 2

Discuss the chemical properties of one of the materials below and their associated risks and benefits to human health:

1. chemical additives in foods
2. pharmaceuticals
3. cosmetics and perfumes
4. household cleaning products
5. spices and herbs
6. other pertinent chemical (see teacher for approval before proceeding)

topic reference: <http://www.edu.gov.on.ca/eng/curriculum/secondary/2009science11_12.pdf>

**Useful web sites:**

[w](http://www.academicjournals.org/)<http://www.brainpop.com/>

[ww.academicjournals.org/](http://www.academicjournals.org/)

[www.ehow.com](http://www.ehow.com)

[www.organicconsumers.org/corp](http://www.organicconsumers.org/corp)

[www.the**fertilizer**guide.com/**effects**ofchemical**fertilizers**](http://www.thefertilizerguide.com/effectsofchemicalfertilizers)

[www.cape.ca/toxics/**pesticides**.html](http://www.cape.ca/toxics/pesticides.html)

[www.medicinal-**herbs**-and-**spices**.com](http://www.medicinal-herbs-and-spices.com)

scienceray.com › [Technology](http://www.google.ca/url?url=http://scienceray.com/category/technology/&rct=j&sa=X&ei=tcYlTqi2LemKsgL0wpDwCw&ved=0CFYQ6QUoADAG&q=chemical+properties+of+road+salt&usg=AFQjCNHZKVUC41KZdKlEydYMtFmj1X6e0g)

www.hc-sc.gc.ca

<http://www.cdpr.ca.gov/docs/emon/pubs/ehapreps/eh9403.pdf>

ptcl.chem.ox.ac.uk/~hmc/hsci/**chemical**s/**hydrochloric\_acid**.html

Other useful web sites

Online dictionary - <http://dictionary.reference.com/>

Plagiarism – practical examples to avoid the pitfalls

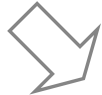
Example 1

(This paragraph was copied directly from Wikipedia, this is plagiarism)

The cell is the functional basic unit of [life](http://en.wikipedia.org/wiki/Life). It was discovered by [Robert Hooke](http://en.wikipedia.org/wiki/Robert_Hooke) and is the functional unit of all known living [organisms](http://en.wikipedia.org/wiki/Organism). It is the smallest unit of life that is classified as a living thing, and is often called the building block of life.

The correct way to share this information is to cite it in quotation marks (these must appear at the beginning and the end of the cited work and must also include the source of the information)

The source reference can be shown below the cited work or in the references

«*The cell is the functional basic unit of* [*life*](http://en.wikipedia.org/wiki/Life)*. It was discovered by* [*Robert Hooke*](http://en.wikipedia.org/wiki/Robert_Hooke) *and is the functional unit of all known living* [*organisms*](http://en.wikipedia.org/wiki/Organism)*. It is the smallest unit of life that is classified as a living thing, and is often called the building block of life* » http://en.wikipedia.org/wiki/Cell\_(biology)

(or with a reference at the end of the project with a number link (example **1**).

(in reference the line below would appear)

1. <http://fr.wikipedia.org/wiki/Cellule_animale>

Important reminder !!! A source must be precise. The link above is precise, however, if we write simply Wikipedia, this is insufficient, and can be considered as plagiarism.

Example 2

All living organisms are composed of cells which is the smallest component of any living thing. The cell was discovered by Robert Hooke.

The example above is still plagiarism since the information was simply re-written from someone else. Furthermore, it is also plagiarism since the source was not cited. Therefore, even if we read something and write it in our own words and don’t cite the source; it is plagiarism!

To correct this issue, we must follow one of the correction methods in example 1 above.

**Evaluation rubric – Culminating project – Matter and Chemical Bonding**

Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| --- | --- | --- | --- | --- | --- |
|  | Level 1 *Student:* | **Level 2**  *Student:* | **Level 3**  *Student:* | | **Level 4**  *Student:* |
| Knowledge and Understanding | | | | | |
| Knowledge of terminology and definitions related to matter and chemical bonding:  *(e.g., ionic, covalent, atomic radius, electronegativity)* | Demonstrates **limited** knowledge of content | Demonstrates **some** knowledge of content | Demonstrates **considerable** knowledge of content | | Demonstrates **thorough** knowledge of content |
| Understanding of content related to matter and chemical bonding:  *(e.g., properties of elements within a period, relative bond strengths, )* | Demonstrates **limited** understanding of content | Demonstrates **some** understanding of content | Demonstrates **considerable** understanding of content | | Demonstrates **thorough** understanding of content |
| Thinking and Investigation | | | | | |
| Use of initiating and planning skills and strategies to prepare the **audio/visual** lesson.  *(e.g, selecting strategies and resources, developing plans, gathering and organizing information)* | Uses initiating and planning skills and strategies with **limited** effectiveness | Uses initiating and planning skills and strategies with **some** effectiveness | Uses initiating and planning skills and strategies with **considerable** effectiveness | | Uses initiating and planning skills and strategies with **a high degree** of effectiveness |
| Communication | | | | | |
| Expression and organization of ideas and information (e.g., clear expression, logical organization) in oral, visual, and written forms (e.g., diagrams, models) | Expresses and organizes ideas and information with **limited** effectiveness | Expresses and organizes ideas and information with **some** effectiveness | | Expresses and organizes ideas and information with **considerable** effectiveness | Expresses and organizes ideas and information with **a high degree** of effectiveness |
| Use of communication for your classmates with the purpose of **teaching** **a new concept** related to matter and chemical bonding in oral, visual, and written forms. | Communicates for different audiences and purposes with **limited** effectiveness | Communicates for different audiences and purposes with **some** effectiveness | | Communicates for different audiences and purposes with **considerable** effectiveness | Communicates for different audiences and purposes with **a high degree** of effectiveness |
| Application | | | | | |
| Application of knowledge of matter and chemical bonding in familiar contexts.  *(e.g. household cleaning products, fertilizers, pesticides)* | Applies knowledge and skills in familiar contexts with **limited** effectiveness | Applies knowledge and skills in familiar contexts with **some** effectiveness | | Applies knowledge and skills in familiar contexts with **considerable** effectiveness | Applies knowledge and skills in familiar contexts with **a high degree** of effectiveness |
| Making connections between science, technology, society, and the environment  *(e.g., assessing the risks and benefits of certain chemicals on human health. These chemicals could include food additives, pharmaceuticals or cosmetics and perfumes.)* | Makes connections between science, technology, society, and the environment with **limited** effectiveness | Makes connections between science, technology, society, and the environment with **some** effectiveness | | Makes connections between science, technology, society, and the environment with **considerable** effectiveness | Makes connections between science, technology, society, and the environment with **a high degree** of effectiveness |
| □ R- (20%) □ R (30%) □ R+ (45%) □ N1- (52%) □ N1 (56%) □ N1+ (59%)  □ N2- (62%) □ N2 (66%) □ N2+ (69%) **□ N3- (72%) □ N3 (76%) □ N3+ (79%)** □ N4- - (82%) □ N4- (86%) □ N4 (90%) □ N4+ (94%) □ N4++ (98%) | | | | | FINAL MARK: |

**UNIT ONE: Matter and Chemical Bonding**

|  |  |
| --- | --- |
| Knowledge and Understanding | / 15 |
| Inquiry | / 20 |
| Communication | / 13 |
| Application | / 7 |

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**Part A: Multiple Choice (15 marks)**

1. Which number gives the number of energy levels in a Bohr-Rutherford diagram of an atom?
2. Atomic mass number
3. Atomic number
4. Group number
5. Period number
6. None of the obove
7. What is the number of electrons in 1735 Cl-1?
8. 16
9. 17
10. 18
11. 34
12. 35
13. What are the forces between ionic molecules called?
14. Electrostatic d) polar covalent
15. Covalent e)b and d are correct
16. Dipole-dipole
17. Polar covalent
18. b and d are correct
19. Which atom has the largest electron affinity?
20. In
21. Sb
22. Na
23. Rb
24. Al
25. Which of the following elements has the smallest radius?
26. Rb
27. Ba
28. F
29. Zn
30. Li
31. Elements in the same family tend to be similar in which way?
32. Electron arrangements
33. Numbers of electrons
34. Atomic mass
35. Similar isotopes
36. Both a and c are correct
37. Which of the following is a non-metal?
38. Ti
39. Cu
40. Sr
41. Cl
42. Fe
43. The elements in the periodic table are arranged according to?
44. Atomic mass
45. Number of neutrons
46. Reactivity
47. Atomic number
48. Which of the following elements is most reactive?
49. Mg
50. Cl
51. Br
52. Kr
53. S
54. Which of the following compounds has the most polar bond?
55. K2O
56. SO2
57. CaO
58. Li2O
59. H2O
60. What is the correct formula of the ionic compound formed when calcium and nitrogen bond?
61. CaN
62. Ca2N3
63. Ca3P
64. CaP3
65. What type of bond forms when there is only fluorine present?
66. Ionic
67. Non-polar covalent
68. Polar Covalent
69. Covalent
70. What type of bond forms when barium and bromine react?
71. Ionic
72. Non-polar covalent
73. Polar Covalent
74. Covalent
75. The correct Lewis Diagram for ammonia, NH3 will have \_\_\_\_\_ non bonding electrons on the central atom?
76. 0
77. 2
78. 4
79. 6
80. None of these
81. Which of the following compound has a cation (positive ion) and anion (negative ion) that is isoelectronic?
82. LiBr
83. H2O2
84. CaO
85. CaCl2
86. BeO

**Part B: Short Answers (Inquiry – 20 Marks)**

1. Distinguish between electron affinity and electronegativity. (2marks)
2. Explain J.J Thompson’s model of the atom. How is this different from what we know today? (2 marks)
3. I) Which of the following elements a) P b)Mo c) Na d) Fr

II) Explain your answer. (2 marks)

1. Draw the Lewis structures for the following molecules and compounds. (9 marks)

a) H2S b) CH2O c) N2H

d) SiBr4 e) C2H5OH f) FCl

g) Mg3N2 h) C3H8 i) LiF

1. Give two properties of an ionic bond. What types of atoms are involved in ionic bonding and give an example of a molecule not on this page. (4 marks)

**Part C Communication (13 marks)**

1. What type of bond forms between the following atoms? (show all calculations on the answer sheet). Also draw the Lewis dot diagram for each atom. (4 marks)
2. Oxygen and Magnesium
3. Carbon and Sulphur
4. Carbon and Hydrogen
5. Iron (II) and fluorine
6. Circle the polar bonds (on the answer sheet) for the following molecules. Show all bond calculations on the answer sheet. (3 marks)

. . .. ..

1. H – P – H b) : O = Si – Cl : c) H H H

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: Cl : : Cl : H – C – C – C – H

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: Cl : H :O – H

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8) The following are structural formulas of covalently bonded molecules. Identify the following as polar or non polar molecules by circling the polar molecule(s). Please answer this question on the answer sheet and show all your calculations. (2 marks)

1. H – C =N
2. O=C=O
3. H – C – H

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O

1. I = I

II) List 2 characteristics a polar molecule must have. (2 marks)

1. What is a metallic bond? Give two properties of this type of bonding. (2 marks)

**Part D: Application (7 marks)**

1. Fireworks give off many different colors. Explain with the aid of a diagram how these colors are produced and why there are a variety of colors (4 marks)
2. A molecule of chloroform (CHCl3) has the same shape as a molecule of methane (CH4). Methane has a boiling point of -164˚C and chloroform has boiling point of 62˚C. Explain the different between boiling points. (3 marks)